

XI. Notes on two Australian species of *Trigona*.

By HAROLD J. HOCKINGS.

[Read August 1st, 1883.]

OF these stingless bees of Australia two varieties only have come under my immediate observation, but I believe there are several others both here (Queensland) and in the Southern Colonies, some of which differ but little from those described below.

“Karbi” or “Keelar” and “Kootchar” are the names given to them by the natives. The first species may be identical with *Trigona carbonaria*, Smith: it forms a very dark wax, almost black, and the propolis it uses is also very dark. It is nearly three-sixteenths of an inch in length, of a generally black colour, except that the front of the head or face and the sides of the thorax are covered with minute silvery hairs, which give those parts a whitish appearance, even when viewed at some distance, and the abdomen, which in its normal state is nearly circular, when viewed from above, is exceedingly black, and gradually discloses reddish rings at the edges of the segments as it becomes distended with honey. The queen, when *fully* developed, is usually one and a half to twice the length of the worker: when the ovary has not developed, the abdomen is nearly flat; both it and the legs and antennæ are a dirty brown, the head and thorax being black, but as she matures the abdomen increases to about three times its previous size, and develops five distinct rings; it, however, always retains its original downward curve. I have not yet observed drones of this variety, probably on account of their differing but slightly from the workers.

The second species (“Kootchar”) is also black in colour, but has a fine yellow streak across the upper part of the thorax just behind the butts of the wings,*

* This yellow mark is generally extended around the front of the thorax by a line of dots.

and has a few silvery hairs on the face *only*. The queen is fully three-eighths of an inch in length, sometimes a little longer, and is of a lighter colour than in the other variety, being glossy and of a reddish brown. The head and thorax nearly black. The drone is slightly longer and more cylindrical than the worker, and is of a somewhat lighter colour; the antennæ are divided nearer to the head, and are altogether longer; the compound eyes do not extend over the back of the head, as in *Apis mellifica*, but are perceptibly fuller and broader than in the female; the hind legs are convex, with a white line around their edges. They are exceedingly numerous in strong colonies from October to January, when they gradually die off. When the abdomens of workers and drones become distended with food they develop five distinct rings. In some cases a queen may be met with of exactly the same colour, &c., as in the first variety.

Both varieties build their nests in hollow trees, which they render impervious to water by the application (inside) of a very tough but pliable gum, which is insoluble in water, but is highly inflammable; it has a strong and decidedly turpentine-like odour, especially with the first variety.

The eggs, which are deposited in cells previously filled with food and are immediately sealed up, take about three months to come to maturity. I am not yet certain of the exact term, as the construction of the brood-nest makes observation difficult.

"Karbi" gather but little honey, which they store in pots of wax about three-fourths of an inch in height and half an inch in diameter, having their mouths on the top. Building in both varieties is commenced from the bottom and conducted upwards. The shape of isolated honey-pots is somewhat similar to a sparrow's egg, but as they multiply they are so attached to each other that the outer wall of one may form the inner wall in part of those around it, thus economising wax and space; they are usually built in layers, but sometimes in a shapeless mass, and always have some pollen-pots mixed up with them; these are placed near the brood-combs or comb, which is in one piece in the form of a spiral staircase compressed, but wide in the middle, and tapering at the ends, top and bottom; the layers are fastened about one-sixteenth of an inch apart by small stanchions of

wax placed wherever convenient. As the comb is built it is encased in a sheet or circular case of wax about one-sixteenth of an inch away from the cells, to which it is fastened by stanchions or beams of wax, though sometimes attached immediately to a cell in places. Outside the brood-nest and surrounding it, is usually a band of shapeless passages formed of wax and much smeared with adhesive gum, in which the bees seem to loiter much. The honey and pollen-pots are placed against this highly cellular structure on all sides. The pollen is damp or pasty, and is stored in pots exactly similar to those which contain honey. On account of the dark colour of the wax these pots cannot be distinguished, and to obtain the honey the whole mass is usually squeezed, so that it gets largely mixed with the pollen, and receives a sour taste that it has not when in a pure state. Four or five pounds of honey would be a fair yield for one of these hives, and they are not much valued even by the natives.

They are a very fierce variety, and are without fear, and, although they are stingless, are quite capable of defending themselves. Each bee, except when gathering pollen, has a small quantity of colourless gum, of an extremely adhesive nature, on its hind legs; this substance is placed in a thin coat over the wax in the hive, and the bees walk over it without inconvenience. The hive-entrance is very carefully guarded by a line of bees, who inspect every one that arrives, and it is surprising to see how soon a stranger is discovered and pounced on by several before it has time to alight; when caught one bee holds each leg, which it stretches out to its full extent, the wings are treated in a similar manner, and in this position they remain quietly about an hour, when the intruder is usually dead. The object of these robbers is to steal gum, which is placed about the entrance to keep vermin away.

On one occasion (December, 1882) two of these hives threw off swarms simultaneously, which unfortunately came in contact with one another, when a deadly fight ensued, and was continued until the whole were strewn about in a tangled mass dead, chiefly in and about a box which they seemed to have fought for; in single combat they catch each other by the abdomen and tear out the intestines, never releasing the hold once taken, both invariably being killed. The mandibles are well developed,

have two projections* on each in front, and give a very sharp bite when applied to tender skin.

If the hive be opened roughly, or is being robbed, the bees attack the operator most determinedly, chiefly in the hair of the head, beard, and eyelashes, which they gnaw at and smear with gum; they crawl inside the clothes, into the ears, nose, and mouth; very few persons could work at them long without a veil, in consequence of their sticking the eyelashes together, and their biting the lids being very painful. The natives usually kill the bees by smoke, and take the honey at leisure.

“Kootchar,” or the second variety, is slightly more bulky than the first; when injured or seized between the fingers it emits a not unpleasant, but somewhat ant-like, odour, and, although a timid insect, has not so many enemies as the other variety, chiefly, I believe, owing to the odour it is capable of emitting, which may also account for the fact of the other variety, as well as the wasp, hornet, and honey-bee, avoiding them. Should a strange insect be placed in their hive they follow it in a crowd, continuously placing small globules of gummy matter on to its body; this substance seems to be extruded from their mouths, and has a slightly greenish colour when wet, and soon becomes very hard, so that the stranger in time is unable to move, and it is then firmly fastened down and quietly dismembered, the parts being cast from the hive.

The wax of this variety is of a slightly yellowish grey or buff colour, and produces a beautifully white wax when carefully melted down, especially when done by the heat of the sun.

The honey and pollen-pots are a little smaller than those of the other variety, and the contents may be easily distinguished on account of the semitransparent nature of the wax; they (the pollen and honey-pots) are usually stored in different parts of the hive, the former within the entrance, the brood-nest in the middle, and the honey at the back partially surrounding the brood, the whole presenting a very clean and neat appearance.

The brood-cells are globular, about one-eighth of an inch in diameter, and are placed in a conical heap on the top of one another, without any regularity. As in

* A partly serrated edge.

the other variety, they are encased in a sheet of wax to economise the heat necessary for the maturity of the young.

If the hive is being robbed these bees eat the honey greedily at first, then get much excited, dashing aimlessly about in all directions; they do not attack the operator as the others do. In habits they are exceedingly industrious and tractable, but at times quarrel fiercely among themselves. The entrance to their hive is guarded or ornamented by a pipe of propolis about an inch in length, having an exceedingly sticky outer edge; it is by this pipe alone that access to the hive is gained, and it extends inside as far as the brood-nest usually, but sometimes not quite so far.

When the young have reached the second stage of their existence the wax is almost wholly removed from the cocoon, which assumes an oblong form; this wax is probably worked over again (I believe for honey and pollen-pots), as the bees that form them may sometimes be seen bringing a small piece of wax in their mandibles from the passages among the brood-cells. The larva of the queen spins its cocoon over the *whole* of its body (as do drones and workers). I have not observed that these larvæ receive any special treatment; the cells are situated low down in the nest, are much larger than the worker cells, and the food to all appearance is similar in all cases, the cells being filled, the eggs deposited and sealed up in the same way as those which produce workers; the same may be said of drones.

In forming brood-cells they build them with a funnel-shaped mouth, which is either pointed up or outward, according to the direction in which the nest is being extended, and fill them with semi-fluid food, which is prepared in the stomachs of the workers. The egg is forced into the food by the queen, with one end slightly protruding; the funnel-shaped mouth is then immediately closed by a worker-bee—never more than one—kneading it in so that the cell may assume a globular form. In doing this the insect works with the point of its abdomen inserted in the opening, on which it works as on a pivot, turning around and kneading the wax with the head until the operation is performed; if the bee is removed before the completion of the work it is immediately replaced by another; they seem anxious to close the cell directly the egg has been deposited. These

various operations, during which great excitement prevails, form an exceedingly interesting sight.

The pollen of this variety is drier or more firm than with "Karbi." As much as fifty pounds of honey may sometimes be obtained from a nest of these bees, which is an amazing quantity considering the size of the insect.

A great many bees of both varieties are white when hatched, gradually becoming darker, until in about a week they are as black as the others.

The brood-cells of "Karbi" are filled and sealed in the same way as the "Kootchar," but the tops and bottoms are merely oval, the sides being the same shape as in *Apis mellifica*; the mouths are always pointed upwards, except with queen-cells, which usually lie horizontally with the mouth outwards.

The queens are quite incapable of flight when the ovaries are developed, and even appear to walk with difficulty. At night the entrance of the hive is closed by numerous minute globules of semi-fluid gum placed against it, thus forming a thin wall full of air-holes; the hive is closed in a similar way during wet weather and winter.

Both varieties have a zigzag darting flight; they throw off swarms in the same way as other bees, except that I believe a young queen goes off with the swarm, the mother staying in the parent hive. A marked feature in them is that they do not hang together while building, as *Apis mellifica* do; each insect acts independently. There seems to be no cohesion among them, and, when thoroughly disturbed, they remain disorganised until nightfall, when they assemble in a hollow branch, and stand side by side; under no circumstances do they hang in clusters.

Both varieties are common with us in a wild state. "Kootchar" are only to be found where a sandy soil is prevalent; they are plentiful on the coast, but especially on Stradbroke Island, which seems to be their habitat, and the inland natives are also of opinion that they come from the coast. "Karbi" are very scarce near the coast, but abundant inland. The name above given is applied to them by the inland natives; the coast tribes call them "Keelar," and say they belong to the bush (interior).

The wings of both varieties project slightly over the

abdomen. The slightest degree of cold seems to deaden them, while heat induces activity. They treat their queens with the greatest respect, and appear even to fear them. When the young bees have hatched, the cocoons are removed and placed in a heap, each being rolled into a ball; this heap is reduced by fits and starts, and is sometimes not touched for as much as a month.

The "Kootchar" are easily united by simply taking one queen away and packing her brood-nest, bees and all, against the brood in the hive it is intended to be joined to; if any bees return to the old hive they may be shaken in at night and the hive removed. This cannot be done with "Karbi," as they would fight and kill one another.

When either variety takes up its abode in a space that is too large for them they partition it off at a convenient distance with a wall of Eucalyptus gum mixed with rubbish, which is added to from time to time, and gradually becomes very thick and hard. If broken pots of pollen be placed in a hive when the winter is approaching, the broken parts are covered up with wax to preserve it; but, if put in when the spring has broken, it is apparently unheeded.

Several small birds eat the "Karbi," but I am not aware of any eating "Kootchar." Both varieties have small heaps of soft gum about the size of a pea placed all over the inside of the hive; sometimes one is placed outside the entrance. This substance is similar to that with which they close their hives at night, and should their hive by any chance get broken a line of it is placed around the opening while it is being closed with a firmer substance.

The moth* is a small grey insect, the female about seven-sixteenths of an inch in length, the male a little less, having a remarkable yellow tuft over the whole of the front of the head. Eyes black; long, thin, hair-like antennæ; proboscis but slightly developed, about 1-32nd inch long, and curved inwards; outer wing rounded at the apex, with slight corrugations running half-way up; under wing, much lighter in colour than the outer, runs to a point at the edge; both wings have a hairy fringe, but it is fuller and more even on the *under*. The female

* *Achroea grisella*, Fabr.—E. A. F.

has a retractile ovipositor, somewhat more than one-sixteenth of an inch in length. When in repose the antennæ lie back along the wings, which are folded in the form of a half-cylinder.

It increases very rapidly, and is very destructive to bees' combs, especially those containing broods; it develops itself in the foundation, or division of the cells, which it gnaws away without injury to the bees further than that when they come to maturity they are often unable to emerge from the cell on account of their being fastened by the silk of these larvæ, and, should they emerge, their wings are so fastened with the silk that they cannot fly, and get lost on leaving the hive. The bees will destroy them, and cut the combs away to do so, when their young emerge or die in the cells.

This insect thrives on raw sugar, which is manufactured in great quantities in this colony, but I have noticed that it develops itself more abundantly in imported dried fruits (currants and raisins), which I believe come from the Mediterranean, and it has occurred to me that it might possibly have been imported from thence. It cannot be *Galleria cereana*, as, from an illustration and description which appeared in the 'British Bee Journal,' I have identified that as a larger moth, which differs in several points.

The beetle* is a "flower-hunter," but sometimes attacks the bee-hives here in great numbers.

The specimens sent by Mr. Hockings and exhibited at the Meeting held on August 1st, 1883, were (1) two "Kootchar" queens; (2) numerous "Kootchar" workers; (3) numerous "Kootchar" drones; (4) one "Karbi" queen; (5) numerous "Karbi" workers; (6) "Karbi" wax and propolis; (7) "Kootchar" wax and propolis; (8) "Karbi" honey-pots; (9) "Karbi" brood; (10) "Kootchar" honey-pots; (11) "Kootchar" brood; (12) "Karbi" queen-cell; (13) "Kootchar" queen-cell; (14) numerous wasps "from a nest containing thousands," a very distinct small *Odynerus* not in the National Collection; (15) greenish bees—two specimens of a *Nomia*

* *Protætia mandarina*, Weber.—E. A. F.

near *N. australica*, Smith; (16) sand bees—two specimens of *Allodape simillima*, Smith; (17) large bee with red abdomen—*Megachile ustulatus*, Smith; (18) Wax Moth—*Achroea grisella*, Fabr.; (19) hive beetle—*Protetia mandarinea*, Weber; (20) smaller but somewhat similar beetle—*Euryomia brunnipes*, Kirby; (21) bright green beetle—*Diphucephalus* sp. ?, two specimens unnamed in the National Collection.—E. A. F.